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IN THE CLAIMS

1. (currently amended) A method for estimating a parameter of interest of an earth formation with a tool having a nuclear radiation source and a nuclear radiation detector spaced apart from the nuclear radiation source, the method comprising:

(a) activating the nuclear radiation source;

(b) defining a starting time for a processing time window using a relationship of the form:

$$istr = K / \Sigma$$

where *istr* is the start time of a window, K is a constant, and Σ is a capture cross section at the ending time of the processing time window for the earlier operation of the source

~~at which measurements made by the nuclear radiation detector are responsive primarily to the parameter of interest;~~

(c) processing the measurements for determining an ending time for the processing time window at which the measurements are substantially uncontaminated by noise; and

(d) analyzing the measurements within the processing time window for estimating the parameter of interest.

2. canceled

3. (previously presented) The method of claim 1 wherein the nuclear radiation source comprises a pulsed neutron source.

4. (previously presented) The method of claim 1 wherein the measurements made by the nuclear radiation detector comprise gamma ray measurements.

5. (previously presented) The method of claim 3 wherein the parameter of interest comprises at least one of (i) a thermal neutron capture cross section of the earth formation, (ii) porosity, (iii)formation water salinity, and, (iv) the quantity and type of hydrocarbons contained in pore spaces.

6. canceled

7. canceled

8. (currently amended) The method of claim 1 wherein determining the ending time of the processing window further comprises forming a running sum of count rates starting at the starting time and determining a time at which a count rate has a predetermined relation to the running sum.

9. canceled

10. canceled

11. (currently amended) An apparatus for use within a borehole penetrating an earth formation for estimating a parameter of interest of said earth formation, comprising:

(a) a nuclear radiation source ~~irradiating~~ configured to irradiate the earth formation;

(b) a nuclear radiation detector spaced apart from said nuclear radiation source;

(c) a processor ~~which~~ configured to:

(i) ~~defines~~ defined a starting time for a processing time window using a relationship of the form:

$$istr = K / \Sigma$$

where *istr* is the start time of a window, K is a constant, and Σ is a capture cross section at the ending time of the processing time window for the earlier operation of the source ~~at which measurements made by the nuclear radiation detector are responsive primarily to the parameter of interest~~; and

(ii) ~~processes~~ process the measurements to determine an ending time for the processing time window at which the measurements made by the nuclear radiation detector are substantially uncontaminated by noise.

12. canceled

13. canceled

14. (previously presented) The apparatus of claim 12, wherein the nuclear radiation source further comprises a pulsed neutron source.

15. (previously presented) The apparatus of claim 14, wherein the measurements made by the nuclear radiation detector comprise gamma ray measurements.

16. (currently amended) The apparatus of claim 14, wherein the parameter of interest determined by the processor further comprises at least one of (i) a thermal neutron capture cross section of the earth formation, (ii) porosity, (iii)formation water salinity, and, (iv) the quantity and type of hydrocarbons contained in pore spaces.

17. canceled

18. (currently amended) The apparatus of claim 11 wherein the processor determines the ending time based on forming a running sum of count rates starting at the starting time and determining a time at which a count rate has a predetermined relation to the running sum.

19. canceled

20. canceled

21-28. Canceled

29. (currently amended) The apparatus of claim 11 further comprising a conveyance device which conveys the tool into a borehole in the earth formation, the conveyance device selected from the group consisting of (i) a wireline, and (ii) coiled tubing.

30. (previously presented) The apparatus of claim 29 wherein the conveyance device is one of (i) a wireline, (ii) coiled tubing.

31. (currently amended) The apparatus of claim 11 further comprising a channel number generator ~~which produces~~ configured to produce a numerical sequence of memory address codes corresponding to a sequence of adjacent time windows.

32. (previously presented) The apparatus of claim 11 further comprising a mass storage unit associated with the processor.

33. (previously presented) The apparatus of claim 31 further comprising a

spectrum accumulator.

34. (currently amended) The apparatus of claim 30 wherein the conveyance device comprises a wireline, the ~~system~~ apparatus further comprising a depth controller ~~which provides~~ configured to provide signals indicative of a depth of said tool.

35. (new) A method for estimating a parameter of interest of an earth formation with a tool having a nuclear radiation source and a nuclear radiation detector spaced apart from the nuclear radiation source, the method comprising:

(a) activating the nuclear radiation source;

(b) defining a starting time for a processing time window at which measurements made by the nuclear radiation detector are responsive primarily to the parameter of interest;

(c) determining an ending time for the processing time window by forming a running sum of count rates starting at the starting time and determining a time at which the count rate has a predetermined relation to the running sum; and

(d) analyzing the measurements within the processing time window for estimating the parameter of interest.

36. (new) The method of claim 35 wherein defining the starting time further

comprises determining a time at which a value of the measurements has a predetermined relationship to an estimated value of a parameter of interest at an ending time of a processing time window for an earlier operation of said source.

37. (new) The method of claim 35 wherein the nuclear radiation source comprises a pulsed neutron source.

38. (new) The method of claim 35 wherein the parameter of interest comprises at least one of (i) a thermal neutron capture cross section of the earth formation, (ii) porosity, (iii)formation water salinity, and, (iv) the quantity and type of hydrocarbons contained in pore spaces.

39. (new) The method of claim 2 wherein said relationship is of the form

$$istr = K/\Sigma$$

where *istr* is the start time of a window, K is a constant, and Σ is a capture cross section at the ending time of the processing time window for the earlier operation of the source.

40. (new) An apparatus for use within a borehole penetrating an earth formation for estimating a parameter of interest of said earth formation, comprising:

(a) a nuclear radiation source configured to irradiate the earth formation;

(b) a nuclear radiation detector spaced apart from said nuclear radiation source;

(c) a processor configured to:

(i) define a starting time for a processing time window at which measurements made by the nuclear radiation detector are responsive primarily to the parameter of interest;

(ii) processe the measurements to determine an ending time for the processing time window by forming a running sum of count rates starting at the starting time and determining a time at which the count rate has a predetermined relation to the running sum; and

(iii) analyze the measurements within the processing time window to estimate the parameter of interest.

41. (new) The apparatus of claim 40, wherein the processor defines the starting time by determining a time at which a value of the measurements has a predetermined relation to a determined value of a parameter of interest at an ending time of a processing time window for an earlier operation of the nuclear radiation source.

42. (new) The apparatus of claim 42, wherein the nuclear radiation source further comprises a pulsed neutron source.

43. (new) The apparatus of claim 42, wherein the parameter of interest determined by the processor further comprises at least one of (i) a thermal neutron capture cross section of the earth formation, (ii) porosity, (iii)formation water salinity, and, (iv) the quantity and type of hydrocarbons contained in pore spaces.